## Chapter 3: Safety p.256 11/30/17
## Chapter Challenge

There is none.

## 3.1 Accidents p. 260 11/30/17

**WDYS?** A simulation of a car crash

Crash testing a car with fake people, smoke from the car going fast, front of the car is smashed, driver(dummy) is hitting his face on the airbag,

I see a car crashing into a huge airbag, making the car wreck as well as get an airbag in the car to go off. I can see a mannequin that represents a child in the back seat. I also see that the kids teddy bear flew out of the car.

**WDYT?** Wear a seat belt
Make sure everyone else is wearing a seat belt
Be aware of your surroundings

Keep your seatbelt on at all times, have your seat back enough from the airbags.

I think you could protect yourself by putting on your seatbelt. We could also protect ourselves by making sure we have airbags in the car that will work in case of an accident.

## 3.1 Accidents p. 260

IWBAT evaluate my understanding of safety, identify and evaluate safety features in selected automobiles, compare the safety features in selected automobiles, and identify safety features required for other modes of transportation.

I will do this via participating in collaborative experiments, team and whole class discussions to clarify key concepts, and collaboratively answering questions targeting key concepts using vocabulary such as accidents, casualties, and safety.

## 3.1 Accidents p. 260

a. T
b. F
c. F
d. F
e. F
f. F
g. F
h. T
i. F
j. T
k. F
l. F
m. F
n. T
o. T

## 3.1 Accidents p. 260

### Physics Talk

- If you get into an accident in a safer vehicle, the chances of injury are limited. Pedestrians can also be hit by automobiles.
- In 1965 Ralph Nader wrote the book "Unsafe at Any Speed" to highlight safety problems with the lack of seatbelts, solid steering columns, and hard interiors in cars. Since then manufacturers have improved the safety of their vehicles.
- 4WD crashes increased by 85% between 1990 & 1998. The number of fatal crashes decreased by 25% in the same time period. The safety features work to keep you safer, but you can't drive crazy and expect to not crash.

IWBAT evaluate my understanding of safety, identify and evaluate safety features in selected automobiles, compare the safety features in selected automobiles, and identify safety features required for other modes of transportation.

## 3.1 Accidents p. 260

PtG p. 265 #1 and one of #2, 3, or 4

IWBAT evaluate my understanding of safety, identify and evaluate safety features in selected automobiles, compare the safety features in selected automobiles, and identify safety features required for other modes of transportation.

## 3.5 Momentum: Concentrating on Collisions p.304 12/05/17

WDYS? A simulation of a small cart like car hitting the back of a huge monster truck

A big monster truck with a dummy driving, there's a little kid riding a go kart really fast, the kid crashes into the monster truck, there is a dummy bird

WDYT? Speed of both cars and safety precautions inside vehicle(seat belt, etc.)
The small race car most likely because they can reach high speed and the truck is a lot more sturdy and heavy

## 3.5 Momentum: Concentrating on Collisions p.304

IWBAT apply the definition of momentum and conduct analyses of momentum in pairs of objects in one-dimensional collisions.

I will do this via participating in collaborative experiments, team and whole class discussions to clarify key concepts, and collaboratively answering questions targeting key concepts using vocabulary such as mass, momentum, and collision.

## 3.5 Momentum: Concentrating on Collisions p.304

### Investigate

Use the built-in spring (piston) on one cart for these elastic collisions.

IWBAT apply the definition of momentum and conduct analyses of momentum in pairs of objects in one-dimensional collisions.

## 3.5 Momentum: Concentrating on Collisions p.304

### Physics Talk

- Momentum = mass x velocity and is given the symbol p, $p=mv$
- All vehicles have different masses, the large masses make cars and trucks extremely dangerous to pedestrians. It is the relative masses, not the absolute masses of colliding objects that matter.
- In a real accident, if a vehicle hits a pedestrian, the pedestrian will move a lot faster than the vehicle was moving.
- A high speed automobile can have the same momentum as a slow moving massive truck. The damage an automobile can produce is related directly to its momentum. Vehicles have different momenta depending on their mass and velocity.
- Collisions between two objects involve changes in momentum for both objects. A moving vehicle colliding with a stationary vehicle will lose momentum and the stationary vehicle will gain momentum.

IWBAT apply the definition of momentum and conduct analyses of momentum in pairs of objects in one-dimensional collisions.

# 3.5 Momentum: Concentrating on Collisions p.304

CU p. 307 #1-3
PtG p. 309 #1-6

IWBAT apply the definition of momentum and conduct analyses of momentum in pairs of objects in one-dimensional collisions.

# 3.6 Conservation of Momentum p.310 12/07/17

**WDYS?** Roller coaster being tested , A guy timing the rollercoaster, Another guy writing down notes on the rollarcoaster

A simulation of what looks like a rollercoaster with a guy timing it and another guy recording observations

Cart one and two are crashing into one another, there are two kids recording the information of the crash, the red car looks a little bigger than the blue one, there is an animal in the blue car

I see a really weird looking roller coaster with two test mannequins and a don in the front. I that the red cart has more speed than the blue car that only holds a pearson, but the blue cart has a dog and 1 person in the cart. I could also see someone checking how far the blue cart moves after the collision. Last thing i noticed was a cat.

**WDYT?** They use the simulation people and cars, and things to measure the time, speed, distance, and how the car reacts and how the "people" react.

I think the investigators use a timer and a ruler to reconstruct an accident. I think that by using a time and ruler there are able to understand what caused the results of the accident. As well as how much momentum each factor had to understand the results.

The traffic-accident investigators use the damage of the car to estimate how fast they go and run simulations on the vehicle to get a better look at the accident at first hand

The physics principals traffic accident investigators use is mass, and momentum to reconstruct the accident.

## 3.6 Conservation of Momentum p.310

IWBAT understand and apply the law of conservation of momentum and measure the momentum before and after a moving mass strikes a stationary mass in a head-on collision.

I will do this via participating in collaborative experiments, team and whole class discussions to clarify key concepts, and collaboratively answering questions targeting key concepts using vocabulary such as mass, momentum, and collision.

## 3.6 Conservation of Momentum p.310

### Investigate

Use either velcro-velcro or magnet-magnet so the carts stick together after they collide. Pistons should be stowed flush with the surface of the end of the cart.

IWBAT understand and apply the law of conservation of momentum and measure the momentum before and after a moving mass strikes a stationary mass in a head-on collision.

## 3.6 Conservation of Momentum p.310

Physics Talk

### Conservation of Momentum

momentum before collision = momentum after collision

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v_f$$

(parenthses indicate a sticky collision)

- Momentum is conserved in all collisions. If you add up all of the momenta before the collision, the sum of the post-collision momenta is the same.
- The momentum before the collision equals the momentum after the collision if no external forces act on the system.
- Nature conserves momentum. The objects may move in new directions with new speeds, but the momentum remains the same.
- Traffic accident investigators use tread marks and damage to the automobiles to understand what happened at the time of the accident.
- Physics allows you to predict the future. If you know the masses and velocities of the objects before the collision, you can accurately predict the velocities after the collision.

IWBAT understand and apply the law of conservation of momentum and measure the momentum before and after a moving mass strikes a stationary mass in a head-on collision.

## 3.6 Conservation of Momentum p.310

CU p. 315 #1,3
WDYTN p. 317
PtG p.319-20 #3, 5, 7, 9

IWBAT understand and apply the law of conservation of momentum and measure the momentum before and after a moving mass strikes a stationary mass in a head-on collision.

# 3.7 Impulse and Changes in Momentum: Crumple Zone

p.321 12/11/17

**WDYS?** I see a car that is preparing to prevent an accident with springs that bump into the object. I also see the person who is taking notes, impressed or amazed of what is happening. I also see the guy who is driving the vehicle exited.

A simulation of a cart going down a hill. The cart has legs attached to it in the front. The carts legs are crashing into a wall and there is another person recording observations.

**WDYT?** I think that some factors that automobile designers should consider when designing a crumple zone as a safety feature is the front of the car having a material that could absorb the energy making it with a less injury to the passenger.

The sturdiness or stableness of the crumple zone, Material used to make the crumple zone, how the passenger will react to the crumple.

# 3.7 Impulse and Changes in Momentum: Crumple Zone

p.321

IWBAT design a device that is able to absorb the energy of a collision and reduce the net force on an object in a vehicle; describe collisions and crumple zones in terms of momentum, impulse, and force; apply the concept of impulse in collision analysis; compare the change of momentum of a vehicle before a collision with the impulse applied during a collision; and explore ways of using cushions to increase the time over which a force acts during a primary collision.

I will do this via participating in collaborative experiments, team and whole class discussions to clarify key concepts, and collaboratively answering questions targeting key concepts using vocabulary such as impulse, momentum, and collision.

## 3.7 Impulse and Changes in Momentum: p.321
### Crumple Zone

Complete Investigate Part A only.

IWBAT design a device that is able to absorb the energy of a collision and reduce the net force on an object in a vehicle; describe collisions and crumple zones in terms of momentum, impulse, and force; apply the concept of impulse in collision analysis; compare the change of momentum of a vehicle before a collision with the impulse applied during a collision; and explore ways of using cushions to increase the time over which a force acts during a primary collision.


## 3.7 Impulse and Changes in Momentum: p.321
### Crumple Zone


#### Physics Talk

- W = f *d = ΔKE, Decrease the force by increasing the distance to stop the automobile.
- By maximizing the time that the force acts, you minimize the force. F=ma lets you find out how much force is required to stop any automobile.
- A change in momentum is called impulse. Impulse = F*t. A small force over a long time produces a large force over a short time.
- The change in momentum is always equal to the impulse.
- We can choose whether to increase the distance or the time over which the force acts to minimize the force.


IWBAT design a device that is able to absorb the energy of a collision and reduce the net force on an object in a vehicle; describe collisions and crumple zones in terms of momentum, impulse, and force; apply the concept of impulse in collision analysis; compare the change of momentum of a vehicle before a collision with the impulse applied during a collision; and explore ways of using cushions to increase the time over which a force acts during a primary collision.

# 3.7 Impulse and Changes in Momentum: p.321
## Crumple Zone

CU p. 329 #1-4
WDYTN p. 331
PtG p.332-33 #1, 2, 4-6, 10

IWBAT design a device that is able to absorb the energy of a collision and reduce the net force on an object in a vehicle; describe collisions and crumple zones in terms of momentum, impulse, and force; apply the concept of impulse in collision analysis; compare the change of momentum of a vehicle before a collision with the impulse applied during a collision; and explore ways of using cushions to increase the time over which a force acts during a primary collision.